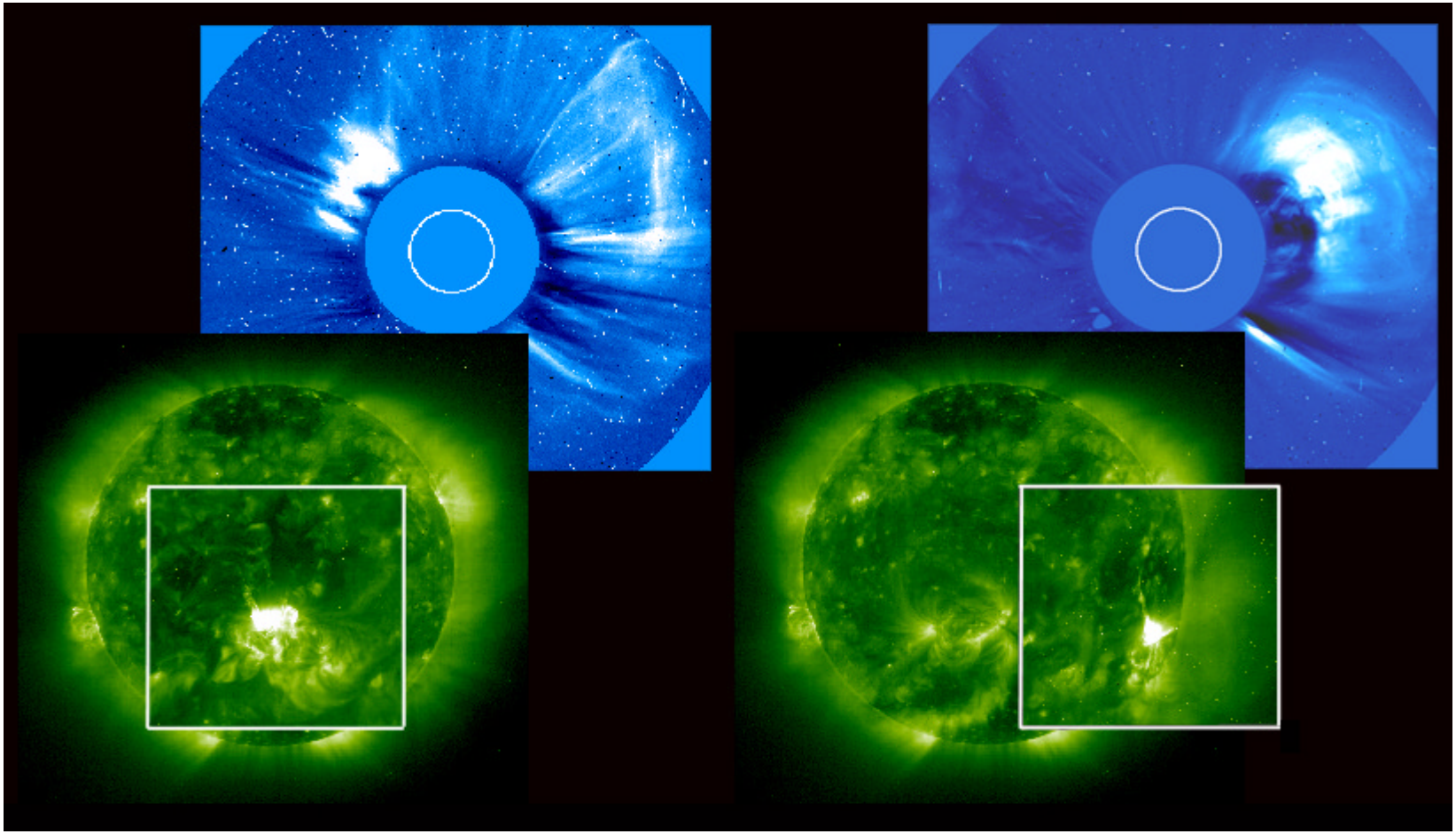
Solar Dynamics Observatory



Green images show eruption of two CMEs from the same region; boxes show closeups of the erupting regions (from SOHO EIT); blue shows the same eruptions, head-on and in profile (from SOHO LASCO)

SDO Mission Goals and Objectives

The basic goals and objectives of the SDO mission are to:

- Understand how magnetic fields appear, distribute, and disappear from their origin in the solar interior to 18 solar radii from the solar surface
- Understand the magnetic topologies that give rise to rapid high-energy release processes that occur on scales from a thousand to many hundreds of thousand kilometers
- Study and gauge the dynamic processes which influence space weather phenomena
- Study the variations in irradiance and solar structure which occur on short timescales as well as over the solar cycle

SDO Major Science Questions

The major scientific questions of the SDO mission are:

- How does the solar interior vary through a solar cycle?
- How does this variation manifest itself in the structure of the Sun's corona and heliosphere?
- What is the origin and effect of sunspots and solar active magnetic regions?
- What are the causes of structural and irradiance variations on the Sun?
- How is the magnetic energy of the Sun reorganized and dissipated?
- What conditions contribute to the impulsive release of energy on the Sun?

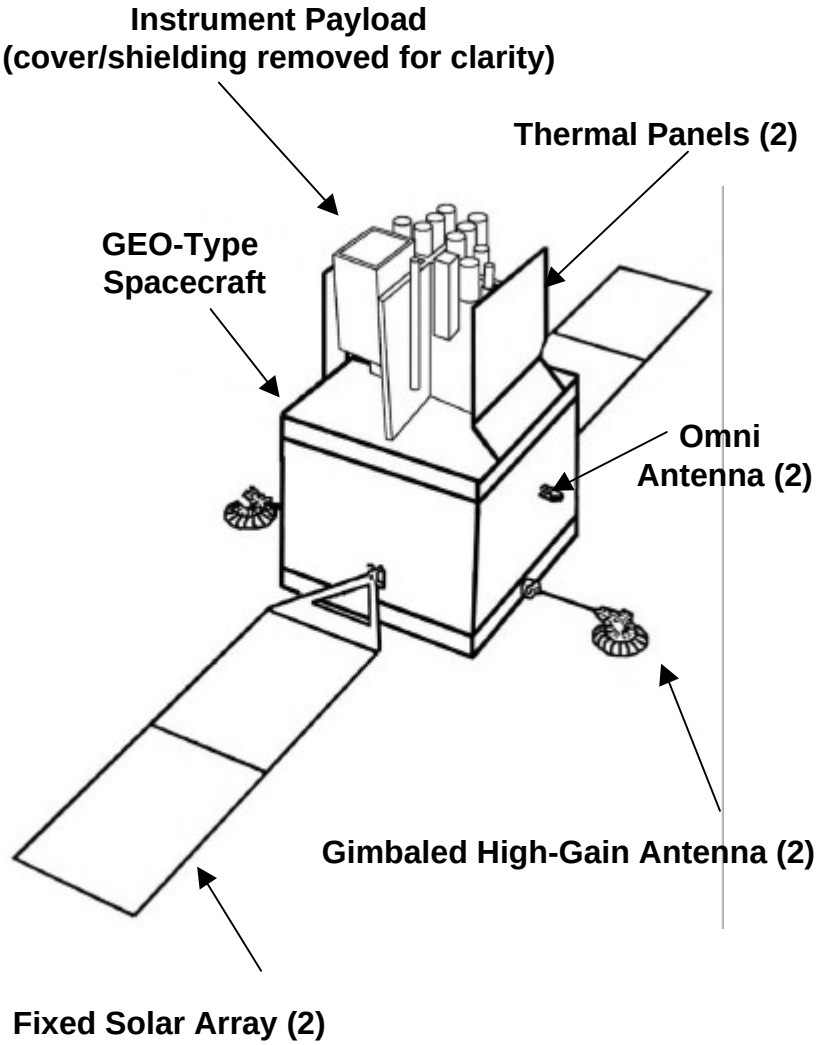
SDO Approach /Methodology

The approach and methodology for the SDO mission are to:

- Make a well-defined and unchanging set of measurements
- Observe continuously for many months at a time
- Observe the solar interior from the atmosphere
- Measure the solar luminosity and irradiance in the UV and EUV
- Image the upper atmosphere and corona in temperature regimes from $4x10^3$ to $9x10^6$ K
- Make all visible and UV images simultaneously on a 10-second cadence
- Measure the vector magnetic field at the solar surface
- Make vector magnetograms on a 5-minute cadence
- Image the top half (in pressure and density) of the convection zone
- Make surface velocity measurements on a 45-second cadence

SDO Mission Description

- The SDO mission employs a three-axis stabilized spacecraft with a complement of solar-pointed instruments to make continuous, high- cadence observations of the Sun from its subsurface layers to its outer atmosphere (see concept illustration). Data obtained from this long-duration mission will vastly improve understanding and forecasting of the Sun's impact on the terrestrial environment.
- The current SDO is an evolution of the Solar Near-Surface Active Region Rendering (SONAR) mission included in the NASA SEC Roadmap.
- The SDO is described in detail and highly rated in the *Astronomy and Astrophysics Decadal Survey Report*.



SDO Mission Characteristics

- Launch from Eastern Range in FY2007
- Medium class launch vehicle to Geosynchronous Transfer Orbit (GTO)
- Geosynchronous orbit with 28.5° inclination
- 5-year mission design life
- Single three-axis stabilized geosynchronous orbit (GEO) bus from the Rapid Spacecraft Development Office (RSDO) catalog with modifications
- Four solar-pointed instrument packages with significant heritage
- Optical bench quality support structure for instrument complement
- Master control computer and large capacity image handling system for the total instrument complement
- One primary ground station
- One standard observing mode for simplicity of operations